DOCUMENT RESUME

ED 025 891 40 EC 003 485

By-MacCubrey, Mary Katharine

Verbal Operant Conditioning of Young Mongoloid Children. Final Report.

Saint Anne's School, Arlington Heights, Mass.
Spons Agency-Office of Education (DHEW), Washington, D.C. Bureau of Research.
Bureau No-BR-8-4038
Pub Date 13 Sep 68
Grant-OEG-0-8-084038-4465(032)
Note-41p.
EDRS Price MF-$0.25 HC-$2.15
Descriptors-*Behavior, Behavior Change, Case Records, *Exceptional Child Research, Group Instruction, Institutionalized (Persons), Language Skills, Language Usage, Measurement Instruments, *Mentally Handicapped, Mongolism, *Operant Conditioning, Reinforcement, Speech Skills, Teaching Methods, Trainable Mentally Handicapped, Verbal Ability, *Verbal Development, Verbal Operant Conditioning

Operant conditioning techniques were used to modify verbal behavior in 18 institutionalized, trainable mentally handicapped mongoloids with chronological ages from 4-6 to 7-10 and mental ages from 2.0 to 2.10. Two instruments were constructed to evaluate language: a language test and a speech rating scale. Project leaders had no prior knowledge of the language test. The six children in group 1 received five 15- to 40-minute group conditioning sessions daily. Shaping was used to condition object and picture naming, descriptions of action pictures in work combinations, and discrimination of colors and polar opposites. Operant procedures were used to lengthen attention span and increase verbal production. The six children in group 2 spent 7 weeks in the enriched experimental environment, but received no conditioning; the six in group 3 remained in the institution. Five of six members of group 1 significantly increased their scores on the Stanfore-Binet posttest; one from group 2 and none from group 3 increased significantly. On the speech rating scale, group 1 showed significantly greater improvement than group 2. Major changes were observed in the social behavior of the 12 subjects who resided in the research facility. (Author/RP)

ED 025871

PA-40
BR. 8-4038
OE-BR

FINAL REPORT

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EC 003 457

U.S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE

Office of Education

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VERBAL OPERANT CONDITIONING OF YOUNG MONGOLOID CHILDREN

Sister Mary Katharine MacCubrey, O.S.A.

Saint Anne's School

Arlington Heights, Massachusetts

September 13, 1968

The research reported herein was performed pursuant to a grant from the Office of Education, U.S. Department of Health, Education and Welfare. Contractors undertaking such projects under Government sponsorship are encouraged to express freely their professional judgment in the conduct of the project. Points of view or opinions stated do not, therefore, necessarily represent official Office of Education position or policy.

U.S. DEPARTMENT OF
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SUMMARY

This research investigates the use of operant conditioning techniques to modify the verbal behavior of trainable mentally retarded children. The subjects were eighteen institutionalized mongoloids with CA 4-6 to 7-10, and MA 2.0 to 2.10. All had normal hearing and the physiological ability to speak, as determined by a speech clinician. Three groups of subjects were identified: Group I spent seven weeks in the research facility, receiving a total of 231 group operant conditioning sessions; Group II spent seven weeks in the same facility under similar conditions, except that they received no conditioning; and Group III remained in the institution. Pre and post testing were done with the Revised Stanford-Binet and a specially constructed language evaluation instrument. A speech rating scale was also used with Groups I and II. Tape recordings were extensively employed to compare verbal behavior before, during, and after the experimental period, and to aid in the individualization of instruction within the group setting. The techniques of shaping and fading-in of non-verbal prompts to elicit functional speech were used to condition 1.) naming of objects and pictures; 2.) description of actions and action pictures in two and three-word combinations; and 3.) discrimination of colors and polar opposites.

Five of the six subjects in Group I improved significantly on the Stanford-Binet, as compared with one in Group II, and none in Group III. All three groups improved significantly on the LEI, but between-group differences were not significant. Group I showed significantly greater improvement on the SRS, partly attributable to quantitative changes in speech production.

Major changes were observed in the social behavior of the twelve subjects who resided in the research facility. Probably these were related to the home-like atmosphere of the facility and the high staff-child ratio.

Comparisons of Groups I and II with Group III are weakened by the fact that three members of Group III spent part of the experimental period visiting parents, while two others became subjects in a behavior modification program within the institution. Obviously, scores on the evaluation instruments were affected by this.

Results suggest that operant conditioning may be an efficient and economical means of modifying verbal behavior in groups of trainable mentally retarded children. Attention span is adequate in some children of this CA and MA, for relatively long conditioning sessions.

CHAPTER I

INTRODUCTION

The problem of improving the language skills of trainable mentally retarded children is seen by many workers in the field as a key area in developing the potential of these children. Private therapy is commonly unavailable to them and is prohibitively expensive for widespread use; thus efficient and economical group methods are needed.

Ellis, Barnett, and Pryer (1960) analyzed the behavior of mental retardates by operant techniques and concluded that such individuals adapt readily to conditioning procedures; their learning follows the same principles as that of other subjects. Subsequently, researchers have used operant principles to modify the behavior of retardates in a variety of areas. Doubros and Daniels (1966) and Chapel (1967) worked to overcome short-term behavior difficulties. Hollis (1967), Mazik (1967) and Rice and McDaniel (1967) conditioned low-grade patients in head-turning, standing, toilet behavior, etc.

A number of researchers have reported the successful modification of verbal behavior in single, atypical subjects. Hewett (1965) and Jensen and Womack (1967) used shaping, the systematic reinforcement of successive approximations to the desired behavior, with autistic children. Weiss and Born (1967) also reported successful conditioning of speech, but the subjects failed to generalize the learned behavior.

Sloane, Johnston, and Harris (1968) and Lovaas (1968) worked with mentally retarded and psychotic children to establish or increase speech. Of particular interest for the improvement of mongoloid speech are the studies of Risley and Wolf (1968) and Johnston (1968) dealing with the problem of reducing echolalia and extending functional speech.

Very few researchers have attempted the simultaneous conditioning of more than one subject. However, Antonitis and Barnes (1961) used the lever-pressing method of studying the free operant behavior of two groups of nursery school children. An informally reported study by Edwards and Lilly (1966) described the use of operant conditioning principles to modify mealtime behavior in severely retarded adolescents and adults. O'Leary and Becker (1967), Hewett (1966) and Linde (1962) studied the application of operant techniques to classroom learning. Operant levels of social interaction were obtained for six young retarded children by Wiesen and his associates. (1967) A "generosity" response was shaped in pairs of subjects by initially reinforcing physical proximity until each child learned to give his partner a piece of candy.

In the present research the subjects were eighteen mongoloids between C.A. 4-6 and 7-10, with M.A.'s between 2.0 and 2.10. The subjects constituted all of the mongoloids in two comparable state institutions, who had C.A's between 4 and 8, M.A.'s of at least two years, and grossly normal hearing and speech mechanisms. Six children, identified as Group I, were selected to receive seven weeks of language training with operant procedures, while living in a home-like research facility. Six children, identified as Group II, were cared for in the same facility and by the same staff, but did not receive operant conditioning. In order to minimize the danger of a "Hawthorne effect" Group II were given traditional type pre-school lessons while Group I received operant conditioning. The two groups were usually kept separate to minimize vicarious learning. The six children identified as Group III were to have remained in the parent institutions as controls for Groups I and II. Because the experimental period coincided with the vacation months, however, these subjects also experienced environmental changes which affected their scores on evaluation instruments.

The specific remedial speech techniques adapted for Group I were shaping, imitation training, a fading-in of non-verbal cues to increase functional rather than echolalic speech, and backward chaining. Outside of the group sessions, subjects were given social reinforcement for appropriate verbal behavior. Some attention was also given to the modification of social behavior. Age and sex-appropriate behavior and good manners were reinforced.

Relatively untrained research assistants and several carefully supervised volunteers were employed and their efficiency studied to determine, if possible, what the role of such persons can be in a behavior modification program. Davison (1966) and Sloane, Johnston and Harris (1968) described the training of students and parents in social and verbal behavior modification respectively.

Research has consistently demonstrated that verbal interaction with adults is more conducive to children's language learning than verbal interaction with peers. Hence the highest possible adult-child ratio was sought.

It was hypothesized that the subjects in Groups I and II would exhibit intellectual and social behavior changes related to the enriched environment, but that Group I would demonstrate greater gains in speech development. Furthermore, it was hypothesized that both I and II would exhibit changes that would not be observed in Group III.

CHAPTER II

METHODS

Subjects

Subjects of this research were eighteen institutionalized mongoloids between C.A. 4-6 and 7-10, having M.A.'s of 2.0 to 2.10, as determined by administration of the Revised Stanford-Binet Intelligence Scale, Form L-M. (1960) All of the subjects were in good physical health and were free from gross sensory defect. Nine were identified as mongoloids by chromosome studies and nine by observable physiological signs only. All possessed some speech or the physiological ability to produce speech in the opinion of a speech clinician. An exact language age could not be determined, however, due to the lack of any standardized instrument for this population.

The subjects constituted all of the mongoloids in two state institutions whose C.A.'s were between 4-6 and 7-10 and whose M.A.'s were 2.0 or higher. The two institutions were equivalent in size of ward, staff-patient ratio, and educational facilities. Length of institutionalization varied from one and a half years to seven years nine months. Eleven subjects had been institutionalized from infancy, four had been institutionalized between the ages of one and three, and one each had been institutionalized at ages four, five and six. Although records indicated a wide variety in the amount of interest shown by parents, all twelve of the children resident in the research facility were visited at least once by parents.

Subjects were divided into three groups on the basis of mental age and scores on a language evaluation instrument. Random assignment to groups was, unfortunately, precluded when two subjects contracted an infectious scalp condition and a fourth could not be released for legal reasons to live in the research facility. The final composition of the three groups in terms of C.A., M.A. and language ranking is given in Appendix A. Subjects in Group I lived for seven weeks in the research facility where they received frequent verbal operant conditioning. Group II resided in the same facility, receiving identical treatment except that no operant conditioning was done with them and reinforcement was not systematically administered for desirable behavior. To avoid a possible Hawthorne effect these subjects were given standard pre-school lessons while Group I received conditioning. An example is given in Appendix B. Group III were intended to serve as institutional controls, remaining in the parent institutions. However, three of them visited their families for part of the experimental period and two became subjects in a behavior modification program within the institution.

In the following clinical notes S indicates membership in Group I, PC indicates membership in Group II, and IC indicates membership in Group III.

S_1 is an attractive and personable girl of a short, stocky build. She is the oldest of three children, both siblings being normal. S_1 has been institutionalized from birth, but was the most mature socially of the twelve research facility subjects. Her ability to carry on a conversation and to follow simple directions were especially noteworthy. S_1 is high spirited and mischievous, but her behavior in the conditioning lab was exemplary. In every learning task she reached criterion behavior before any other subject. Her facility in expressive languages is a source of personal satisfaction to her and she needed minimal external reinforcement to generalize newly acquired speech. S_1 was the highest ranking subject on the Language Evaluation Instrument (LEI) and the second highest on the Speech Rating Scale. (SRS)

S_2 is a handsome blond boy of normal height and weight and institutionalized from birth. His two younger siblings are normal. S_2 is somewhat remarkable for his disposition which contrasts with the so-called "typical mongoloid nature". He is a serious, sensitive child who seldom resorts to acting out behavior. S_2 ranked fourth on the LEI and fourth on the SRS. He possessed more speech quantitatively than most of the other subjects, but was difficult to understand, although he scored relatively high on the articulation test. He could not retain any utterances on the echoic retention test and responded correctly to only one preposition. S_2 was generally cooperative in conditioning and often served as a self-appointed assistant to E.

S_3 is a happy, playful boy, short and heavy for his age. He was the eighth and last child born to his parents and was institutionalized at one year. S_3 was usually cooperative in conditioning, the only problem being occassional discouragement when he failed to reach criterion behavior as quickly as S_1, S_2 and S_4. A minor technical problem was that his very light, high-pitched voice was sometimes difficult to hear. S_3 ranked ninth on the LEI (or eighth in the "within project" groups) and sixth on the SRS. He possessed good echoic speech but used less functional speech than the other older subjects. Articulation is impeded by abnormal palatal structure and dentition.

S_4 is an affectionate boy of very slight build. The third of three children, he was institutionalized a

few months after birth. S_4's presenting speech was largely echoic, but he proved very responsive to conditioning. He ranked eighth on the LEI (seventh on the WP ranking) and fifth on the SRS. The difference was related to the fact that speech production was high. Social reinforcement was used outside of conditioning sessions to modify the sex-inappropriate behavior of this subject.

S_5 is a chubby, loveable boy identified as a mosaic mongoloid. He was the seventh and last child, one sibling also showing abnormalities. S_5 possessed no echoic or functional speech at the beginning of the experimental period. However, he used three sounds and an elaborate sign language to good effect. His problem-solving behavior was excellent and usually employed in the cause of mischief. The goals for S_5 were necessarily quite different from those for the other subjects, although the same stimulus materials were used. He was reinforced at first for any vocal response, then for any response other than dä or däi, which were his all-purpose "words". Eventually 25 words were brought under echoic control. Sixteen words were brought under pictorial stimulus control and he used yes and no appropriately.

S_6 is a vivacious and pretty girl, the third of three children, and institutionalized from birth. She was more difficult to handle than most of the other children, being extremely playful and somewhat spoiled. Initially she produced a great deal of babbling when stimuli were presented, but she was conditioned to respond with shorter vocalizations. She proved least responsive to peer approval as reinforcement and was often inattentive when it was not her turn to respond. In contrast, she was extremely sensitive to adult social reinforcement. The language evaluator commented on S_6's babbling, which was always spontaneous and could not be elicited. S_6 scored 0 on the LEI, placing last in the ranking; her SRS ranking was eleventh or second from the last.

PC_1 is an appealing, rather tense girl of grossly normal height and weight. She was the second of three children; the siblings being normal. Institutionalization was at five months. Her behavior in structured situations is good but she is more difficult to handle in other types of activities, due to negativism and unwillingness to share attention and toys. She is enuretic at night and shows nervousness by thumb

sucking and hair pulling. She has a relatively good attention span and works well at school readiness tasks. Her speech is good and she ranked first on the LEI and second on the SRS.

PC_2 is a sociable little girl whose reaction to an emotionally deprived environment is a very strong craving for adult attention and affection. She made a rather poor social adjustment to the project facility. Her speech was good, both LEI and SRS ranks being in the upper quarter.

PC_3 is an aggressive, red-haired boy who gives some evidence of minimal brain damage apart from Down's Syndrome. He speaks from one side of his mouth and was the only subject who exhibited rocking behavior and a stereotyped vocalization. PC_3 had been institutionalized for only eighteen months and was visited weekly by parents and siblings who seem very accepting of him. Thus PC_3 was an atypical subject in several respects. He adjusted well to the project facility and the stereotyped behavior decreased markedly. His LEI ranking was sixth (fifth out of 12 WP), while his SRS ranking was ninth. This is the largest difference between the two language instruments and is attributable to the fact that the quantity of his speech production was very low.

PC_4 is a short, obese boy with a placid, cheerful disposition. There are two normal siblings, older than he, and institutionalization was at three years. Initially PC_4 was extremely inactive physically, seldom leaving his chair. Mobility increased to the point where he voluntarily made nine trips up and down stairs in a two-hour period. PC_4 ranked seventh on both the LEI and SRS. He had excellent echoic behavior and a surprising memory.

PC_5 is an appealing, but rather spoiled boy, the third of four children, of whom three are normal. He is identified as a mosaic mongoloid. PC_5 initially presented very babyish behavior which was modified during the experimental period. PC_5 had a powerful emotional attachment to S_6, which evidently began when the two were in adjacent cribs as infants. It is interesting that these two children exhibited a far greater amount of babbling behavior than any of the other subjects. PC_5's babbling could be elicited, unlike that of S_6. He ranked tenth on the LEI (ninth among the twelve WP) and eighth on the SRS.

PC_6 is a handsome blond boy with few physiological signs of mongolism. A chromosome study has been done. PC_6 was younger by five months than any other subject. A Revised Stanford-Binet I.Q. could not be obtained for him since he refused testing. He was admitted on the basis of a Cattell Infant Intelligence Scale quotient of 42 obtained twelve months earlier and developmental information supplied by the nurse and ward attendant, which suggested that his M.A. was approximately two.

IC_1 is a Puerto Rican girl institutionalized from birth in this state. She is the youngest of fourteen children; both parents are mentally ill. IC_1's testing behavior resembled that of a normal seven-year old; she had considerable poise. On the LEI she ranked third. During the experimental period IC_1 suffered from ear aches and was taken to the doctor frequently.

IC_2 is a cheerful, cute boy who has three normal siblings. He was institutionalized 28 months ago at the age of five, but is taken home for visits, one of which occurred during the experimental period. IC_2 ranked seventh on the LEI.

IC_3 is an active and aggressive boy institutionalized from birth. He uses a good deal of unintelligible jargon. IC_3 ranked twelfth on the LEI.

IC_4 is a dark haired girl institutionalized from early infancy. She is pathetically eager for adult attention. IC_4 could not be taken into the research facility because of an infectious scalp condition; however, she was admitted to a behavior modification program within the institution. She ranked eleventh on the LEI.

IC_5 is a nice-looking, quiet boy, institutionalized for three years. He visited his family for part of the institutional period. IC_5 ranked thirteenth on the LEI.

IC_6 is a homely, but appealing girl, extremely short for her age. She has two normal siblings and has been institutionalized from birth. This subject spent her first six years in an extremely deprived institutional setting where she was given only the most minimal

custodial care. All of her speech has been learned since she was transferred to the state institution one year ago. The language evaluator found her extremely uncooperative in testing and her rank of sixteenth does not reflect her true ability.

Evaluation Instruments

No appropriate evaluation instrument exists for determining the language age of the population from which the subjects were drawn. A test was, therefore, especially constructed by a speech clinician for this project. It was decided that neither of the project teachers should have prior knowledge of the instrument, which was administered before and after the experimental period. The language evaluation instrument (LEI) required between 20 and 35 minutes for administration. A description of the seven subtests comprising the instrument may be found in Appendix C.

The Revised Stanford-Binet Intelligence Scale, Form L-M, 1960, was selected for psychological testing because it is the most reliable and best standardized instrument with norms extending to the two-year level. A limitation of this instrument is that it grows progressively more verbally loaded, at each age level. Since mongoloids are typically more retarded in language than in other areas and since institutionalized children are characterized by poor language development, the older subjects were penalized on the Binet Scale more than the younger subjects. In this research the chronological age range was forty months and the mental age only ten; so that C.A. was more useful in classifying subjects than M.A.

It was anticipated that some of the most significant changes in verbal behavior would be difficult to assess in a structured test setting and by a testor who did not know the subjects. Consequently, a Speech Rating Scale (SRS) was constructed for use with Groups I and II. (Appendix D) Rating was done by the project staff on the fourth and the fiftieth days of the research. Obviously, Group III could not be rated since the staff had no opportunity to observe them in the same types of situations, i.e., eating, bathing, playing, etc. The SRS definitely measured changes which the LEI did not, particularly quantity of speech production, spontaneous word combinations, and syntax. It is interesting, however, that the rank ordering of subjects on the first administration was very similar to the LEI pre-test rank ordering. Appendix A provides scores and ranking on both instruments. A ranking of Group I and II subjects on the LEI is also included for comparison with the Group I and II SRS ranks. The column is entitled WF for "within facility".

Research Setting and Materials

The research facility was a comfortable ten-room frame house on the wooded campus of a private school.

The conditioning laboratory was a 12x7 undecorated room with high windows on two sides. It was furnished with six child-size chairs, a high stool for E, a small table for materials and a stand for the tape recorder. A toilet was adjacent, but generally subjects took care of their needs before sessions. A small school bell was kept on the window sill to announce the beginning and close of "school", as the sessions were called. A glass jar of M&M's was also kept on the window sill, with a box of pennies when these were to be used for reinforcement. The laboratory was well insulated against extraneous visual or auditory stimuli.

Materials were kept in a closet when not in use. These consisted of objects and pictures. The former, of which there were approximately fifty, were mostly functional, such as kitchen utensils and foods. Ten objects were doll-size replicas of large objects. Over one hundred pictures were used to elicit naming behavior. These were cut from magazines, coloring books and picture books. Sixty action pictures from similar sources were used to condition word combinations. A number of the Little Golden "Shape Books", were used in the sixth and seventh weeks of research for interest value and to elicit conversation.

A list of the vocabulary and other concepts taught is located in Appendix E.

Schedule

A copy of the daily schedule may be found in Appendix F. Originally seven brief conditioning sessions had been planned. However, when it was found that subjects adjusted rapidly to longer sessions, the number was reduced to five, ten to forty minute sessions. The longer periods were preferable from an educational standpoint, and the modified schedule made possible the planning of many activities and outings which would have been precluded by the original time-table.

Subjects were required to remain on their chairs throughout the sessions; their ability to do this is surprising, even when their C.A.'s alone are considered. It is, perhaps, significant that in the free time following the long early morning session the older subjects often elected to watch an educational television program, while the younger two engaged in active play.

Carefully controlled outings for individual subjects and small groups, as well as for the two "classes", separately and together,

insured that each child received equal amounts of adult attention. The outings included trips to various types of stores, rides in the car and on the bus, brief visits to private homes, and walks to a near-by ice cream parlor. All twelve of the children spent a day at Cape Cod.

The schedule had been arranged in such a way that Group II children would have some activity during the conditioning sessions, so that they would not perceive themselves as deprived. However, they did hear the school bell and soon learned that the lab door opened only for others. On a few occasions one of the Group II children expressed a desire to attend a conditioning session. This was allowed five times during the seven weeks, in order to satisfy curiosity and because it was a valuable means of checking on differential verbal behavior between groups.

During the experimental period 231 conditioning sessions lasting from ten to forty minutes were held. Duration of the sessions was contingent upon the respondent behavior of the subjects and their physical needs. The first session each day was held at 7:45 a.m., after the children had breakfasted and been to the toilet. This was often the longest session since the children were in optimum physical condition and the weather was still cool. The second session, held at ten, was frequently the most successful, in terms of performance, because retention from the earlier session was good. The third session was held at 11:45, just before the children's lunch. The fourth session, at 3:00 or 3:30, followed the afternoon rest and snack. This proved the most difficult time, as the children who had just awakened were often cranky and uncooperative. It was also very warm in the lab at this time of day. The fifth session was held at 5:30, preceding the children's dinner. On Sundays the schedule was modified. The children attended Church between the first and third sessions. The afternoon schedule was disrupted by visits from parents, and usually one session was lost. On two other days, when the children were taken on long trips, the number of sessions was reduced.

An advantage of having the project director control the subjects' total environment was that the attendance record was excellent. The number of sessions attended by each subject was as follows:

S_1	230
S_2	230
S_3	230
S_4	231
S_5	229
S_6	230

Staff

The unique staffing arrangements constituted an important aspect of this research. Subjects were accustomed to staff who were "on duty" with them only for a certain number of hours. When behavior modification programs are set up in this type of situation, the experimenter is faced with the problem of continually changing personnel, some of whom may be unable or unwilling to cooperate with the program. In this research the project director, assistant director, and two teaching assistants remained in the research facility for approximately twenty-three hours a day for seven weeks. All meals were taken in common and each night two of the four staff members slept with the children to be available if they awakened. The staff were aided by students, and volunteers from a religious community. Adult-child ratio was usually 1 to 3 or 1 to 2.

The research design had called for the two teachers to alternate class periods between Group I and Group II. However, during the planning sessions the project director became alerted to the danger that the second teacher might inadvertently use operant techniques with Group II subjects. Discussions and a perusal of lesson plans revealed that games, songs and materials planned for Group II were quite similar to those planned for Group I. It was decided that the possibility of differential teaching abilities and personality factors biasing the results was offset by the possibility that Groups I and II might receive almost identical treatment. Thus the project director became the sole teacher for Group I and the assistant director for Group II. The two teachers were seldom absent from their own groups, so that systematic reinforcement of Group I's verbal behavior was always under the director's supervision. However, there were many opportunities for the teachers to become acquainted with each other's groups since the same living facilities were shared. The groups ate in the same room, but at separate tables.

The research design also called for an assistant in the conditioning lab to administer the tangible reinforcers and to remove children for time-out from positive reinforcement. It was discovered that an additional adult in the lab served to distract the subjects. The teacher found that discipline could be maintained and the behavior modification carried out without assistance. This fact is interesting because it suggests that the use of operant techniques may increase the number of trainable children whom a single teacher can handle. Outside of the conditioning lab an assistant was always needed to help with Group I.

Teaching Techniques and Reinforcement

The initial conditioning goal was on-seat, attending behavior for five minutes. The rapidity with which this behavior was

learned probably reflects the almost pathetic desire of the subjects to please the adult who had suddenly become the key figure in their environment. The assignment of chairs to individual subjects had not been planned, but the children settled on particular places and, with one exception, maintained these throughout the project.

Reinforcement during verbal conditioning sessions was always administered for the desired response or a currently acceptable approximation. The reinforcement consisted mainly of M&M's, tokens, and verbal and social reinforcement administered by the teacher. After each correct response she showed approval by smiling and exclaiming, "Good boy!" "Good girl!" M&M's were administered on a variable intermittent schedule contingent upon the current need for tangible reinforcement according to the teacher's assessment. Initially, four M&M's spaced through a ten to fifteen minute session were adequate to supplement the regular verbal and social reinforcement. However, between days 10 to 38, the number administered varied from 7 to 14, depending on the length of the session, the time of day, and the desire of the subjects for candy. As the subjects became habituated to the high degree of social stimulation in the project their response to social reinforcement weakened and more candy was used. Subjects were required to consume the M&M as soon as it was given, since dropping and removing candy from the mouth occurred otherwise. Pennies also proved effective as tangible reinforcers, but were more difficult to use. Little bags were provided, but the children played with these, dropped the pennies on the floor, and, in one case, stored a coin under the tongue. The subjects used pennies to buy bubble gum, or hoarded them as status symbols.

On particularly warm days the children wore few clothes to some of the sessions, and talcum powder was used as the tangible reinforcement. The teacher would tap the base of a can of powder so that powder was emitted from the top and fell on the subject.

Peer approval, expressed by clapping, cheers, and "Good boy", etc., proved an extremely effective reinforcement especially when manipulated by the teacher. For S_3, S_4, and S_5 this was the single most effective reinforcer for the first five weeks of the experimental period. If peer response to a correct answer was not spontaneous upon the teacher's expression of "Good!" it could be elicited by the teacher's saying, "Wasn't that good? Didn't Richie say that well?", etc.

S_1 was the only subject who from the beginning appeared to find talking intrinsically rewarding. Late in the experimental period the other subjects also needed less external reinforcement. During the final twelve days tangible reinforcers became less and less needed. In several cases M&M's were omitted entirely, while in others they were given only upon request at the end of a session. S_5 and S_6, the two youngest subjects, were most often the ones who requested candy.

In the final two weeks punishment in the form of hand slapping was occasionally administered during conditioning to S_2, S_5, and S_6 to suppress uncooperative behavior. Until this time rare discipline problems had been handled with "time out" from positive reinforcement. The child was sent out of the conditioning lab and invariably sat down outside the door and wept. The disgrace of being excluded was a powerful deterrant. However, as the children became more relaxed and "at home" in the research facility they tended to act much like normal children, in that teasing behavior and general naughtiness increased. The "time-out" means of suppressing this was time consuming and tended to disrupt the group. Also, it had been specified that no subject would be given therapy outside of the regular sessions; and absences were undesirable. Thus an aversive stimulus was occasionally administered. Another remedy was negative reinforcement. If a child was not attending or was consistently failing to produce verbal behavior of which he was deemed capable, the teacher would distribute M&M's to all of the other subjects, explaining, "When we try hard we get candy. $S_{_}$ didn't try hard so S doesn't get any candy. S_5 was so responsive to this non-reward that he learned to return to his seat as soon as the teacher stretched out her hand toward the candy jar.

Outside the conditioning sessions tangible reinforcement was never given except that the granting of certain types of requests was made contingent upon the child's emitting a verbalization at his current level. For example, in order to receive a second helping at meals, S_1 and S_2 (at week 5) were required to say "May I have more, please?" S_3 and S_4 were required to say, "Mo, peez"; S_6 was required to say, "Mo"; and S_5 was required to say, "Bo", which was the closest approximation that he could produce to the desired behavior. Aside from these instances, which were relatively few, social reinforcement in the form of smiles, praise, and occasional demonstrations of affection were used to reinforce all examples of desirable verbal behavior.

Operant conditioning principles were also used to a limited extent to change socially inappropriate behavior for the age and sex of subjects. Specific goals were:

1. the reduction of excessive and inappropriate demonstrations of affection such as hanging on people, embracing strangers, etc.

2. the institution of hand shaking as an appropriate greeting.

3. the choice of activities and toys, particularly for the boys, which are considered appropriate for their sex.

4. the ability to differentiate between men, women, boys and girls in real life and in pictures.

5. the extinction of inappropriate toilet behavior by S_4.

Generally speaking, the modification of social behavior lay outside the scope of this research. It was assumed, however, that such changes would take place in the radically different environment of the research facility. The choice of specific conditioning goals was made as a result of observation when the subjects were taken to public places or when visitors came to the facility. Verbal interaction with adults was almost invariably terminated when subjects exhibited over-affectionate behavior. Words were literally smothered!

Interesting feed-back on subject perception of the conditioning process was obtained when S_2 on his own initiative took over a session. The teacher had entered the lab after several subjects were seated. S_2 was seated on teacher's stool with a pile of stimulus pictures on his lap. "Ah do; ah do", he insisted; then told teacher to sit down. After turning on the tape recorder teacher sat in S_2's place for a 10 minute session during which S_2 mimicked teacher's behavior with the stimulus materials. It was noted that he selected only those which he himself knew. The desired verbal responses were copiously rewarded with M&M's. A major departure from teacher's behavior was S_2's reaction when a responding S failed to give the correct answer or failed to remain on his seat and attentive. S_2 would become angry and shout, "Bad boy!", "No good", etc., although this type of behavior had not been exhibited by the teacher. Evidently this is a type of behavior which S_2 and probably his peers identify with the teacher role. As might be expected, the other subjects reacted negatively; three of them showed resentment and a fourth showed hurt feelings. S_2 apparently enjoyed the experience, since he frequently asked to repeat it. On other occasions S_3, S_4, S_5 and S_6 had brief opportunities to take over the "class". Their efforts were unsuccessful either because they could not maintain discipline or because their learning was insufficient to sustain the role. S_1 refused an opportunity, although she ranked first in verbal ability and ability to control others.

The following procedure was used to institute on-seat behavior during verbal interchange between the teacher and the six experimental subjects.

As soon as the subjects were seated the teacher asked, "Do you like candy?" Everyone replied affirmatively. "If you sit on your chair you get candy", T said. As soon as she picked up the candy jar,

two S's jumped up and approached her. T gave candy to the other four S's and placed one on each of the two empty chairs. The S's returned and ate the candy standing up. When asked to sit down they did. Three minutes later T reached for the candy jar, saying, "You are sitting on your chairs, so you get candy". Two S's again got up. This time no candy was placed on empty chairs. The S's returned to the chairs looking expectant. After giving candy to the other subjects T repeated, "If you sit on your chair, you get candy." The two S's sat down quickly and were reinforced. The third time candy was given, one subject was off-chair; he scurried back for the candy without any words from T. He laughed and the other five S's laughed; it was obvious that the "game" had been learned. In this first session the verbal content was intended only to encourage attending behavior during verbal interchange between T and S's. Questions were answered in unison. The positive identity statement was introduced by holding up objects and saying, "What is this?" (Subjects respond) "Yes! This is a ball!" The objects introduced were ball, bell, block, and bag. These were found to be in order of difficulty. Probably all subjects knew ball, but thereafter S_1 or S_1 and S_2 together would name the object and the other subjects would echo their answer. All subjects were reinforced.

At the second session the objects from session I were reviewed and pictures of the ball, the bell, and the block were shown. S_1 and S_2 were able to recognize the objects and name them without a verbal prompt from the teacher. The other S's echoed the desired response. They could, when asked, produce the response for the object stimuli without verbal prompts, but were not able to name the pictures at this session. S_5 gave evidence of comprehending what was desired; he made gestures to indicate the correct objects when the pictures were presented. Shaping was used with this subject and with S_6. At this session S_5 articulated "ba" for ball. The other approximations were farther from the desired behavior. No words were emitted by S_6, but babbling was reduced. Vocalization was also brought partially under stimulus control. Heretofore it could never be elicited, but was always spontaneous.

Other goals of early conditioning sessions were the learning of names, parts of the body, and parts of the room. Very simple songs or chants were used. The teacher sang, "Where is Bobby; where is Bobby?" Subjects continued, "There he is; there he is", pointing to the subject named. When pointing to each of six subjects and the teacher had been learned, subjects were reinforced for naming individuals when asked, "Who is this?" The negative identity statement was first introduced at this time. Teacher would ask, "Is this Bobby?", pointing to Jimmy. At first subjects responded by saying the correct name. Eventually four were conditioned to shake heads and say, "No". Teacher would complete the statement, emphasizing, "No, this is not Bobby." The subjects found this a very amusing game and sometimes

played it outside of sessions. The verbal interchange was abbreviated to: "Wha' di'?" "Ba'" (ball) "No' ba', boo'." (Not ball, book)

Colors were taught by a fading-in process. Initially the teacher elicited imitative responses pairing the verbal prompt with a large sheet of colored paper. "Paper" was taught as a name, then the second order statement, "This paper is red." Subsequently, teacher would hold up the piece of paper and ask, "What color is this paper?" Subjects were also asked to tell who was wearing a red shirt, etc. Graduated plastic rings of different colors were used because of the speed with which they could be handled and because it was undesirable to tie the color names exclusively to paper.

The earliest attempt to institute word combinations was the teaching of first and last own names. Two reasons for this were the safety and social values of knowing one's own name and the fact that learning of the first name was already accomplished in four of the subjects. S_1, who had a three syllable name, already knew the name, but articulation was so poor that no-one could recognize what she said. Criterion behavior was learned. S_2 had a five syllable name. He learned the three-syllable last name, but articulation of the first name remained poor. S_3 had a five syllable name which he learned. S_4 had a four syllable name. Eventually he was able to say this without verbal prompts. The other two subjects found this task too difficult. However, they were able to recognize both their first and last names when a list was read.

Backward chaining was used with S_1, S_2, S_3, and S_4 to elicit word combinations. Most commonly, the action pictures were used as non-verbal prompts. For example, one picture showed a boy watching television. Several subjects spontaneously labeled this picture "T.V." This level of responding was the one reinforced with S_5 and S_6. With the other subjects the teacher would say, "Watch T.V.?" The four subjects would be asked separately for echoic response of this. Often for S_3 and S_4 this was the highest level of responding which could be brought under functional control when the verbal prompt was faded out. But S_1 and S_2 were able to learn, "Boy watch T.V." The word-combining behavior generalized well outside of the lab. A major advantage of chaining was its suitability for use in a group. The same materials could be used with subjects who were working at one-word, two-word, and three-word levels of responding.

Polar discriminations proved to be the most difficult concept for the subjects. A big and a little bowl, two plates, and other pairs of objects were also used. The concept of long and short was introduced with two sticks. Initially, pointing was used to indicate the correct choice, but having subjects walk over and pick up their

choice proved superior. S_1 and S_4 became so proficient after six-teen sessions that they could follow two-term commands, such as, "Bring me the little bowl and the long stick." S_2, S_3, and S_5 learned to follow one-term commands in the same number of sessions. S_6 never reached criterion behavior. She was able to choose the correct article only about 75% of the time at the close of the experimental period.

CHAPTER III

RESULTS

Table 1 presents the pre-and post-experimental scores of eighteen subjects on the Revised Stanford-Binet and the Language Evaluation Instrument, and the scores of Group I and II subjects on the Speech Rating Scale. It will be seen that all of the Group I subjects increased scores on the RSB; five changes being significant. Only one member of Group II (PC_4) increased significantly. A second member, who had been untestable on the RSB, obtained an I.Q. of 44 on the post-testing. This subject had earned 42 on the Cattell Infant Intelligence Scale one year prior to the experiment. No member of Group III increased significantly on the RSB.

Seventeen of the eighteen subjects improved on the Language Evaluation Instrument, the increments ranging from five to 44 points. Pre-experimental scores on the LEI ranged from zero to 87. All of the large improvements were made by subjects who had initially scored below 37. The six subjects who had scored above that (range, 47 to 87) had a maximum increment of 14 points. One decreased 16 points. In most cases these were the oldest subjects and those who had the most speech.

The pre-experimental scores on the Speech Rating Scale ranged from nine to 42. All twelve of the Group I and II subjects showed increments of at least three points. Again the largest increments were gained by younger subjects, although differences were not so great as on the LEI. The number of improvement points ranged from +3 to +16, as compared with a range of -16 to +44 on the LEI.

Table 2 presents the pre-and post-experimental ranking of subjects on the LEI and the SRS. A "within facility" ranking on the LEI is given for Groups I and II for comparison of these same subjects on the SRS, which was not administered to Group III. When a sign test is performed the differences between groups are not significant on the LEI. The differences between Groups I and II on the SRS are significant, however, with Group I subjects showing significantly greater improvement in rank order. It must be emphasized that this instrument was neither constructed nor administered by persons trained in language evaluation. Possible, the chief point in its favor is the similarity of ranking of subjects on both instruments. In cases where there is marked lack of similarity, reasons obviously lie in the subject's differential abilities in the skills measured by the two instruments. PC_3 is a case in point. He was weakest in quantity of speech, word combinations, and syntax.

Differences between SRS ranks are in many cases so small that they cannot be considered meaningful.

TABLE 1

PRE AND POST TEST SCORES ON THREE INSTRUMENTS

	Revised Stanford-Binet[1]			LEI			SRS[3]		
	Before	After	Imp.	Before	After	Imp.	Before	After	Imp.
Group I									
S_1	35	44	+9	87	93	+6	40	47	+7
S_2	31	39	+8	62	72	+10	36	47	+11
S_3	31	34	+3	32	69	+37	31	44	+13
S_4	36	45	+9	33	58	+25	33	45	+12
S_5	38	46	+8	6	34	+28	9	20	+11
S_6	39	46	+7	0	39	+39	10	26	+16
Group II									
PC_1	32	35	+3	84	98	+14	42	45	+3
PC_2	33	34	+1	59	69	+10	37	41	+4
PC_3	31	34	+3	47	53	+6	25	31	+6
PC_4	31	36	+5	37	81	+44	30	41	+11
PC_5	35	36	+1	29	68	+39	28	35	+7
PC_6	(40)[2]	44	+?	4	19	+15	14	19	+5
Group III									
IC_1	33	35	+2	78	62	-16			
IC_2	32	32	0	37	64	+27			
IC_3	31	29	-2	27	45	+18			
IC_4	27	30	+3	28	39	+11			
IC_5	28	29	+1	25	30	+5			
IC_6	27	26	-1	2	39	+37			

1. Intelligence quotients below 30 were obtained by using the formula on page 339 of the Manual for the Third Revision (1960)

2. PC_6 the youngest subject, refused testing before the project. An earlier testing on the C.I.I.S. yielded an IQ of 42.

3. Group III were not rated on this instrument

TABLE 2

RANKING CHANGES ON LANGUAGE MEASURES

	LEI			SRS		
	Before	After	DOC[2]	Before	After	DOC
Group I						
S_1	1 (1)[1]	2 (2)	-	2	1	+
S_2	4 (3)	4 (4)	0	4	1	+
S_3	9 (8)	5 (5)	+	6	4	+
S_4	8 (7)	9 (7)	-	5	3	+
S_5	14 (10)	13 (10)	+	12	9	+
S_6	17 (12)	12 (9)	+	11	8	+
Group II						
PC_1	2 (2)	1 (1)	+	1	2	-
PC_2	5 (4)	5 (5)	0	3	5	-
PC_3	6 (5)	10 (8)	-	9	7	-
PC_4	7 (6)	3 (3)	+	7	5	+
PC_5	10 (9)	6 (6)	+	8	6	+
PC_6	15 (11)	15 (11)	0	10	10	0
Group III						
IC_1	3	8	-			
IC_2	7	7	0			
IC_3	12	11	+			
IC_4	11	12	-			
IC_5	13	14	-			
IC_6	16	12	+			

1. Rankings in parentheses indicate the ranking with Group III excluded, for comparison with the SRS rankings.

2. Direction of change.

The degree to which subjects learned the specific material which was taught in the conditioning sessions may best be examined through individual progress reports. It will be recalled that none of the instruments used for pre- and post-experimental evaluation tapped the specific material taught, since the object of the experiment was to increased functional speech in a non-laboratory setting.

S_1's attention span increased from five to approximately 45 minutes. She learned on-seat behavior in two conditioning sessions and learned to take turns in answering questions in five sessions. The latter behavior required occasional reinforcement throughout the experimental period. Time out from positive reinforcement was used when S_1 answered for another subject. She learned to label correctly about 98% of the object pictures. When different pictures of the same objects were brought in she was able to name them, although there were differences in color, size, shape, etc. S_1 learned to describe about one half of the action pictures in three word combinations. She made color and polar discriminations with accuracy, named twenty-six parts of the body, and counted to five. None of these skills were present before the experimental period except the naming of several parts of the body. S_1 possessed relatively good speech when the pre-testing was done; her gains on the LEI and SRS appear small in comparison with those of the younger subjects, who possessed less speech to begin with. She did gain nine points on the Revised Stanford-Binet, raising her tested I.Q. from 35 to 44. Test behavior was excellent on both occasions. No major changes were observed in S_1's social behavior. She functioned best in structured situations or when engrossed in some activity, but was noted for teasing and disobedience at other times. This subject's school readiness was obvious to everyone who worked with her.

S_2 learned on-seat behavior in two sessions and his attention span nearly always proved adequate for the longest classes. He learned "taking turns behavior" quickly and "time out" was needed only twice for lapses. On a few occasions he was moody and refused to participate; the cause was usually hurt feelings. S_2 learned 75% of the object pictures and could describe about one-third of the action pictures in word combinations. He also learned to differentiate between boys, girls, men and women in real life and in pictures. This was important for S_2 because he initially used inappropriate labels in public and was hurt on two observed occasions by the reactions of strangers. S_2 learned five colors, counting to five, and the parts of the body. He could make polar discriminations with accuracy. His scores on most of the LEI increased a little, however, the tester reported that the most significant change was not one which could be measured on the LEI; S_2 engaged her in spontaneous conversation on the post-testing. This skill was noted on the SRS, on which he gained eleven points. His tested I.Q. increased from 31 to 39, test behavior being excellent on both occasions. School readiness is apparent.

S_3 was easily conditioned to on-seat, attending, and taking-turns behavior. Time out from positive reinforcement was used three times for uncooperativeness at the mid-afternoon sessions when he was still sleepy from his nap. S_3 learned 18 parts of the body, counting to five, and six colors. He had some difficulty with polar discriminations but could eventually make them with fair accuracy. He learned 50% of the object pictures and could describe six of the action pictures with word combinations. S_3 gained 37 points on the LEI, which was particularly noteworthy since he was the oldest subject. His performance on the vocal encoding subtest showed the most change. S_3 also gained 13 points on the SRS, but he increased only three points on the Stanford-Binet. The chief social change was a slight reduction in demonstrations of affection.

S_4 conditioned quickly to attending behavior, however, on-chair behavior remained a problem through the fifth week of research. He tended to leave his chair at moments of high interest, rather than the reverse. In terms of verbal behavior changes in the conditioning sessions he made the most obvious improvements. Initially speech was almost entirely echoic. When asked, "What's this?" he would respond, "Di'", or, less often, "Wha' di'". The teacher would ignore this response and present the same object or picture to the next subject, asking, "What's this?" If the subject responded correctly and was rewarded, S_4 characteristically objected, "Hey!" or "Me!" The teacher would explain, "Yes, this is a ball. Susie said "ball; Jimmy, say ball". S_4 responded, "Ball". (Note that "ball" was the final syllable of teacher's prompt.) Teacher would then repeat, "What's this?" If S_4 replied, "Ball" he was given another M&M and everyone clapped. Two weeks were required to learn this behavior; S_4 was able to name about 60% of the pictures. Initially he had no echoic control over two syllables or more. His only word combination was, "Ba' girl". He learned to retain three syllables echoically and used two and three word combinations in and out of conditioning sessions; although he could only describe four of the action pictures, S_4 learned fifteen parts of the body, six colors, and counting to five. Ability to make polar discriminations was excellent. He gained 25 points on the LEI, showing good over-all improvement. He went from zero to six on the object-naming test and from four to eight on the Peabody Picture Vocabulary Test. On the SRS he increased twelve points, due partly to the great quantitative increase in speech production.

The most remarkable changes in S_4's behavior were in the area of social learning. His presenting behavior was immature and effeminate in comparison with the other male subjects. He embraced staff members and visitors at every opportunity, dressed up in girls' clothing, and sat down to use the toilet. It is significant that he could not apply correct gender nouns and pronouns to people or pictures of people. After six weeks in the research facility sex-appropriate behavior was within normal limits for this population. Demonstrativeness

was reduced, although on visiting days he tended to revert to his former behavior with individuals who reinforced this. Another example of improved social behavior was noted at mealtime. Initially two of his companions used him as a stooge, sneaking desirable food from his plate and, on a few occasions, slipping unwanted food onto his plate. S_4 learned to assert himself in these and similar situations. It became harder and harder for the more clever appearing children to "frame" him. S_4's tested I.Q. changed from 36 to 45.

S_5's attention span gradually increased as classes were lengthened. Inattentiveness was never a problem. However, he never learned on-seat behavior adequately. Time out from positive reinforcement was the most effective means of controlling this, but at times a choice had to be made as to the most effective deployment of class time for the group. If his off-seat behavior took the place of inconspicuous standing, and if attention was good, he was sometimes allowed to continue standing; however he was never reinforced while he was off-seat. S_5 was a very active five-year old and quite possibly was not ready for this type of schooling from the physical standpoint. His enjoyment of the conditioning sessions was always apparent, however; and the exerted effort was surprising. He was a great favorite with the other subjects and they reinforced his verbal behavior both in and outside of sessions. S_5 learned about 15% of the pictures in terms of articulating recognizable approximations to the names. He made understandable gestures for nearly all of the pictures, showing that receptive language was good. S_5 used no word combinations; his only syllable combinations were, "Boo boo", for "hurt" and "purple". He learned four colors and could recognize the parts of the body. He did not learn counting and could not say either his first or last name.

Ability to make polar discriminations was quite good, although he required a longer time to condition to this than the older subjects.

S_5 gained 28 points on the LEI, the greatest improvements being on the articulation and P.P.V.T. subtests. He improved eleven points on the SRS. In terms of vocabulary he went from a base-line of no speech to a vocabulary of 25 words. His tested I.Q. changed from 39 to 46.

S_6 learned on-seat behavior in five sessions, but time-out from positive reinforcement had to be used in the fifth week when she again began leaving her seat. Attending behavior was very poor except when the teacher was speaking. Throughout the experiment it remained difficult to determine the correctness of S_6's responses because of the explosiveness and rapidity of her vocalizing. In the laboratory setting her articulation of echoic speech was superior to that of her functional speech. But outside of the lab she seldom used echoic speech. She never used word combinations in the lab, but did so spontaneously at other times.

S_6 did not learn counting or naming of parts of the body. She learned two colors and was able to name eight pictures without being given a verbal prompt. No polar discrimination was mastered. Generally, the teacher felt that she had benefited least from group operant conditioning. However, her improvements on the three evaluation instruments were among the largest made. She gained 39 points on the LEI, the greatest improvement being on the articulation subtest. She also gained 16 points on the SRS, and seven on the Stanford-Binet.

Major changes were observed in S_6's social behavior. Negativism was reduced and self-control improved.

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

The results of this project suggest that trainable mentally retarded children with mental ages between two and three can benefit from group sessions in which behavior modification principles are used to increase functional speech. The rapidity with which the four subjects over five years of age conditioned to on-seat, attending behavior suggests that educators have seriously underestimated the school readiness of some six and seven year old trainable children. Objection is sometimes made that such children need only a play-school type of facility and that confinement to desks and chairs is inhumane. It was the observation of the project staff that all six subjects dropped play activities and came eagerly to conditioning sessions five times daily.

Apparently, seven weeks was not sufficient time to effect significant between-group differences on language evaluation instruments; particularly when the institutional control group was experiencing enrichment of their environment during the project. Although differences were not significant, it may be noted that when improvement points are tallied by groups, the mean increments are 24, 21, and 13, respectively, on the LEI. This suggests that improvement on this instrument was more closely related to the changed environment than to the conditioning. Since the most important changes were noted in the quantitative and syntactic areas, it is most unfortunate that the SRS was not administered to Group III. Quite possibly there might have been significant differences between Groups I and III on this instrument.

It is interesting that Group I showed significant improvement on the Revised Stanford-Binet, while the other two groups did not. Obviously, no attempt was made to improve intelligence quotients, per se, or to provide a well-rounded educational experience. When subjects were not being conditioned they were playing, helping about the house, etc.

One conclusion of the research staff was that the social cohesiveness of the conditioning group had tremendous value for reinforcement. The one subject who was perceived by the others as an outsider, seemed to benefit least from peer support. Consequently, she required a disproportionate amount of teacher reinforcement. This would seem to indicate that careful screening of potential subjects should take place and a conscious effort be made to develop group cohesiveness.

An important aspect of this project was the advantage of having the same staff constantly on duty with the subjects throughout the experimental period. Besides allowing for control of the verbal environment this factor doubtless influenced social changes. Careful clinical records were kept of adjustment characteristics and self-help

skills. (Appendix G) It was noted that as subjects practiced verbal learning with staff members and each other, there was increasing use of cooperative play.

Research is needed on the effects of a longer experimental treatment of subjects similar to those described here. Follow-up testing of these subjects might profitably be done to see if learning is retained and extended. Unfortunately, for comparative purposes, the subjects of this research have returned to radically different environments. One of the parent institutions has been remodeled and five returning subjects have been placed together in a behavior modification program. One subject has been placed in a foster home and six subjects have returned to an unchanged institutional environment. Research should be done with larger samples where control can be exercised over post-experimental environment.

It is strongly recommended that appropriate instruments be constructed and standardized for the language evaluation of moderately and severely retarded children below the chronological age of eight. A weakness of the present research would seem to lie in the measuring instruments. The fact that all of the large improvements on the LEI were made by subjects who initially scored very low, and that these subjects tended to be the younger children, suggests that the skills measured may have been heavily influenced by maturation. It is noteworthy that the largest gains were made on the articulation subtest; possibly the older subjects, who possessed more speech initially, had passed the developmental point where large shifts in articulation would occur spontaneously. An interesting case is that of IC_6 who jumped from two to 39 on the LEI; although her C.A. was 7-9. This subject was very negative in testing the first time but was cooperative during post-testing, which partly explains the difference. But she also has a history of no speech until one year prior to the experimental period, when she was transferred to the state institution from a severely deprived environment. She has made tremendous speech gains in the past year. It would seem that she might be passing through a language developmental stage which most of her mongoloid age-mates reached prior to the first testing. If further use is made of the LEI, it is suggested that attention be given to the weighting of different language skills. Ideally, a single instrument might also be devised to measure the added dimensions which the Speech Rating Scale tapped.

Further research should investigate the classification of moderately and severely retarded subjects into groups which are homogeneous in terms of speech development. With the present sample, having a rather wide C.A. range and a narrow M.A. range, it was found that C.A. was the most meaningful characteristic. There were important differences between the four older subjects and the two younger subjects which may have reduced the effectiveness of the program. The younger subjects differed in that:

1. their attention span was shorter.

2. their physiological and psychological readiness for speech and for classroom behavior was less than that of older subjects.

3. their social immaturity required somewhat different handling.

It is not suggested that these subjects were too young for a program of language behavior modification, but only that their placement with older subjects probably was not an ideal arrangement for either group.

It is hoped that the possibilities of group operant conditioning will be further explored and the results applied to the education of mentally retarded children particularly in large institutions. Findings are needed on the question of optimum group size, content, and methods appropriate for particular chronological and mental age groups, and the degree to which heterogeneity can be tolerated in a group. Operant procedures are not aimed at the "why" of an individual's speech handicap, but at "how" it can be remediated. Nevertheless, further research may demonstrate that subjects whose problems stem from different etiologies respond so differently to group conditioning that they may best be taught in homogeneous groups.

Probably a behavior modification program in the area of language could only be successful if, as in the present study, radical changes were effected in the total life environment of institutionalized subjects.

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APPENDIX A

PRE RESEARCH DATA ON SUBJECTS[a]

	CA Months	MA Months	LEI Score	LEI Rank	LEI W.F.[b]	SRS Score	SRS Rank
Group I							
S_1	84	33	87	1	(1)	40	2
S_2	89	31	62	4	(3)	36	4
S_3	94	32	32	9	(8)	31	6
S_4	83	33	33	8	(7)	33	5
S_5	57	25	6	14	(10)	9	12
S_6	57	26	0	17	(12)	10	11
	(M = 77)	(M = 30)					
Group II							
PC_1	82	30	84	2	(2)	42	1
PC_2	75	29	59	5	(4)	37	3
PC_3	86	31	47	6	(5)	25	7
PC_4	69	26	37	7	(6)	30	9
PC_5	71	29	29	10	(9)	28	8
PC_6	54	(24)est.	4	15	(11)	14	10
	(M = 73)	(M = 28)					
Group III							
IC_1	93	34	78	3			
IC_2	89	32	37	7			
IC_3	82	30	27	12			
IC_4	88	28	28	11			
IC_5	90	29	25	13			
IC_6	93	29	2	16			
	(M = 87)	(M = 30)					

a. Mann-Whitney U tests were performed on all possible combinations for CA, MA, and scores on the LEI and SRS. The only significant difference was between Groups II and III on CA.

b. Within facility ranking (Group III excluded)

APPENDIX B

SAMPLE LESSON PLAN FOR GROUP II

Lesson: Painting

Time: 20 minutes

Objectives:

1. to enjoy a creative experience
2. to learn correct way of holding paint brush
3. to learn how to dip brush into paint and put it on paper
4. to learn that paint on hands is all right
5. to learn that clothing should be protected from paint
6. to learn the color red

Materials:

1. aprons
2. large paper
3. paint brushes
4. red paint powder
5. jar of water
6. individual jars for each child's paint
7. newspapers

Procedure:

Put aprons on, explaining why. Cover table with newspaper, explaining why. Teacher will mix paint in front of the children so that they may see water turn red. She will then pour paint into individual jars. With the aid of the assistant each child will be helped to hold the brush and apply the paint. Teacher will let one child be an example for the others. She will guide his hand for awhile to demonstrate how to paint. Subsequently, she will interfere only as necessary.

Evaluation:

It was necessary to remove the children's top clothing, since the aprons did not offer enough protection. Perhaps finger paints should have been introduced first! Hands, faces, hair, tables, floor, chairs, etc. were painted

More instruction should be given to the assistant. If possible, there should be an assistant to help each child.

Evidently the children enjoyed this experience very much.

APPENDIX C

DESCRIPTION OF LANGUAGE EVALUATION INSTRUMENT

The speech evaluator wished to test speech and language skills which were not specifically taught in the experimental classes. Since standardized tests were not adequate she devised a battery of seven subtests which could be administered in a relatively short time, i.e. a maximum of thirty-five minutes. Four of these subtests were already devised tests with modified scoring procedures to render them suitable for this population.

M&M's were administered intermittently during testing, always being presented for either the completion of an item or subtest, and for attending, if the child's behavior warranted this.

An informal hearing test was administered so that the Tester could ascertain that each child had intact auditory ability adequate for normal speech reception.

A brief oral examination was also conducted. The Tester required the subject to imitate gross motor movements, protruding the tongue, moving it to the left and to the right. Intra-oral pressure was checked by having each child implode air and keep it in the mouth for five seconds.

The following speech and language tests were administered:

1. The Goldman-Fristoe Filmstrip Articulation Test

   Studies demonstrate that there is a high correlation between number of misarticulated phonemes and degree of intelligibility and that if a child is able to make shifts in the articulation of phonemes he is able to modify his speech.

   This test was administered imitatively on 8x5 index cards, rather than as directed.

2. A test of echoic ability

   This test measures the child's ability to repeat increasing numbers of unrelated words. It is found in the validity studies section of the Illinois Test of Psycholinguistic Abilities. The Tester was not primarily concerned with the intelligibility of the words in the utterances, but with the correct number of syllables and words.

3. A test of vocal encoding

This test, also taken from the ITPA, investigates the number of ways a child can talk about an object. Name, color, function, and shape were attributable to each object. With this population it was necessary for the Tester to give more cues than are permitted for normal children.

4. Object naming

Ten pictures were shown to the child in sequence. The Tester showed the picture and asked, "What is it?", giving no cues.

5. The Peabody Picture Vocabulary Test

The purpose of this instrument is to test the child's ability to comprehend single words. Although the norms for this test were inappropriate, the standard procedure for administration was followed. This test more than the other subtests, evaluates receptive language.

6. Preposition comprehension

This test measures the child's ability to comprehend seven prepositions. The child was asked to carry out one-term commands using a ball and a cup.

7. Two and three-term commands

This test measures the length of commands which a child can retain and perform. Items 1-4 are one-term commands; 5-7 are two-term commands, and 8-10 are three-term commands.

APPENDIX D

SPEECH RATING SCALE

Competence

1. barely emerging; 2. very limited proficiency; 3. some proficiency; 4. uses regularly; 5. uses constantly

1. attempts to communicate with gesture and/or sounds
2. uses echoic behavior with sounds and/or words
3. uses at least three sounds or words to convey meaning
4. uses single words for naming, exclamations, and greetings
5. uses single non-naming words and common expressions which convey a unitary meaning
6. uses word combinations in which a sentence is not implied
7. uses word combinations in which a sentence is implied
8. uses here-and-now sentences of at least three words
9. uses not-hear and not-now sentences of at least three words
10. is able to carry on a conversation in which verbal interchange includes at least four functional items, i.e. questions, answers, remarks

APPENDIX E

VOCABULARY AND CONCEPTS TAUGHT IN CONDITIONING SESSIONS

Nouns

apple
arm
baby
bag
ball
banana
bath
bathroom
beads
bed
bell
bike
bird
blocks
boat
book
bottle
boy
box
bread
broom
brush
bug
bunny
butter
button
cake
candy
car
carrot
ceiling
cereal
chair
chest
chicken
chin
clock
comb
cookie
corn
cough
cow
cracker
crayon
daddy
doctor
dog
doll
door
dress
drum
duck
ears
easel
egg
elbow
eyes
face
fingers
fire
fire engine
fish
flower
fork
girl
glass
hair
hand
horse
jello
juice
key
kitty
Kleenex
knee
knife
lady
leaf
leg
man
milk
mittens
mother
mouth
neck
night
nose
nurse
pail
pan
pants
peas
pencil
piano
pig
plane
plate
potato
present
record
road
salad
sand
school
shirt
shoe
shovel
shower
sign
sink
sneeze
soap
sock
soup
spoon
stove
sun
table
teeth
tire
toes
tomato
train
tree
truck
T.V.
wagon
watch
water
window

Verbs

bite
broken
brush
bump
carry
catch
clap
clean up
climb
close
come
cook
cry
eat
fall
feed
finish
go
hear
help
hide
hop
hurt
iron
jump
laugh
listen
look
make
open
pass
pick
play
pour
pray
pull
push
rain
read
ride
ring
run
say
shake
sleep
sing
smell
smile
splash
stand
stop
take
throw
tie
wait
walk
want
wash
work

Pronouns

I me
you
he she
we

Adjectives and Adverbs

now
later
slowly
hungry
thirsty
quiet
sick
good
tomorrow

Polar Concepts

big - little
hot - cold
long - short
yes - no
dirty - clean

Colors

red
blue
green
yellow
orange
purple

Numbers

one
two
three
four
five
many

Miscellaneous

please
thank you
good morning
more
hello
good by
how are you
fine
(own name)

APPENDIX F

DAILY SCHEDULE FOR PROJECT (GROUP I)

5:45 to 6:45 Children rise as they waken, wash, and dress. Quiet play

7:00 Breakfast, followed by toileting

7:45 Condition Session I, followed by T.V., housework, and free play

9:00 Large muscle activities on the playground or in the gymnasium

9:30 Morning snack, toileting

9:45 Conditioning Session II

10:15 Morning activity (trips to the store, etc.)

11:30 Wash up for lunch
Condition Session III

12:15 Lunch, followed by preparation for rest time

1:00 Rest time

2:30 Toileting and afternoon snack

3:15 Conditioning Session IV

4:00 Swimming or other special activities

5:15 Clean up for dinner
Conditioning Session V

6:00 Dinner

7:00 Showers, preparation for bed

7:45 Family Sing, followed by night prayers

8:15 Lights out

APPENDIX G

ADJUSTMENT CHARACTERISTICS AND SELF-HELP SKILLS

Insecurity

dependent
craves adult attention
craves peer attention
easily hurt
resents attention to others

Emotions

unhappy
cries
whines or pouts
tempertantrums
panics easily

Hostility

irritable
assertive
domineering
quarrelsome
vindictive

Rigidity

compulsive
resists change of activity
anxious
afraid of strangers
behavior inappropriate for sex
(describe)

Toilet care (cares for needs: always, usually, needs some help, needs much help)

Dressing

1. underwear
2. a. dress or trousers
   b. buttons
3. socks
4. shoes
   a. laces
   B. buckles
5. pajamas

Cleaning

1. washes hands
2. washes face
3. bathes self
4. keeps nose clean
5. brushes teeth

Feeding

1. uses spoon well
2. uses fork
3. eats neatly
4. drinks without spilling
5. serves self and pours
6. good table manners

Stairs

Household chores (specify)

Remarks

Neatness